

# SH7269 Group

## Renesas Starter Kit User's Manual

RENESAS MCU  
SH Family / SH2A Series

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## Precautions

The following precautions should be observed when operating any RSK product:

This Renesas Starter Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures;

- ensure attached cables do not lie across the equipment
- reorient the receiving antenna
- increase the distance between the equipment and the receiver
- connect the equipment into an outlet on a circuit different from that which the receiver is connected
- power down the equipment when not in use
- consult the dealer or an experienced radio/TV technician for help NOTE: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken;

- The user is advised that mobile phones should not be used within 10m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Renesas Starter Kit does not represent an ideal reference design for an end product and does not fulfil the regulatory standards for an end product.

# How to Use This Manual

## 1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the RSK hardware functionality, and electrical characteristics. It is intended for users designing sample code on the RSK platform, using the many different incorporated peripheral devices.

The manual comprises of an overview of the capabilities of the RSK product, but does not intend to be a guide to embedded programming or hardware design. Further details regarding setting up the RSK and development environment can found in the tutorial manual.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the SH7269 Group. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RSK hardware.	RSKSH7269 User Manual	
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKSH7269 Tutorial Manual	
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKSH7269 Quick Start Guide	
USB Function Manual	Provides sample instructions to configure the RSK and Host PC for running the USB function sample code.	RSKSH7269 USB Function Manual	
Schematics	Full detail circuit schematics of the RSK.	RSKSH7269 Schematics	
Hardware Manual	Provides technical details of the SH7269 microcontroller.	SH7269 Group Hardware Manual	

## 2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analogue-to-Digital Converter
bps	bits per second
CAN	Controller-Area Network
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DIP	Dual In-line Package
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
E10A	On-chip Debugger
EEPROM	Electrically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
HEW	High-performance Embedded Workshop
IIC	Philips™ Inter-Integrated Circuit Connection Bus
IRQ	Interrupt Request
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCU	Micro-controller Unit
MTU	Multifunction Timer Unit
NMI	Non Maskable Interrupt
PC	Program Counter
PWM	Pulse Width Modulation
RSK	Renesas Starter Kit
RSPI	Renesas Serial Peripheral Interface
SDRAM	Synchronous Dynamic Random Access Memory
SFR	Special Function Register
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
UART	Universal Asynchronous Receiver/Transmitter

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## 1. Overview

### 1.1 Purpose

This RSK is an evaluation tool for Renesas microcontrollers. This manual describes the technical details of the RSK hardware. The Quick Start Guide and Tutorial Manual provide details of the software installation and debugging environment.

### 1.2 Features

This RSK provides an evaluation of the following features:

- Renesas microcontroller programming
- User code debugging
- User circuitry such as switches, LEDs and a potentiometer
- Sample application
- Sample peripheral device initialisation code

The RSK board contains all the circuitry required for microcontroller operation.

## 2. Power Supply

### 2.1 Requirements

This RSK is supplied with an E10A debugger. The debugger is able to power the RSK board with up to 200mA. When the RSK is connected to another system then that system should supply power to the RSK. All RSK and RSK+ boards have an optional centre positive supply connector using a 2.0mm barrel power jack.

Details of the external power supply requirements for the RSK, and connections are shown in **Table 2-1** below.

Connector	Supply Voltages
PWR	Regulated, 5V DC or 7-15V DC <b>CAUTION: There is no Over Voltage protection</b> <b>Always confirm the Power supply settings before applying power</b>

**Table 2-1: Main Power Supply Requirements**

In order for the debug LCD to operate, the following jumper settings must be made for the different power supply options:

Jumper	RSK Powered by External 5V Supply	RSK Powered by External 7 to 15V Supply
J16	Jumper across pins 1 and 2.	Open pins 1 and 2.
J17	Jumper across pins 1 and 2.	Open pins 1 and 2

**Table 2-2: LCD Power Supply Options**

The main power supply connected to PWR should supply a minimum of 10W to ensure full functionality.
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### 2.2 Power-Up Behaviour

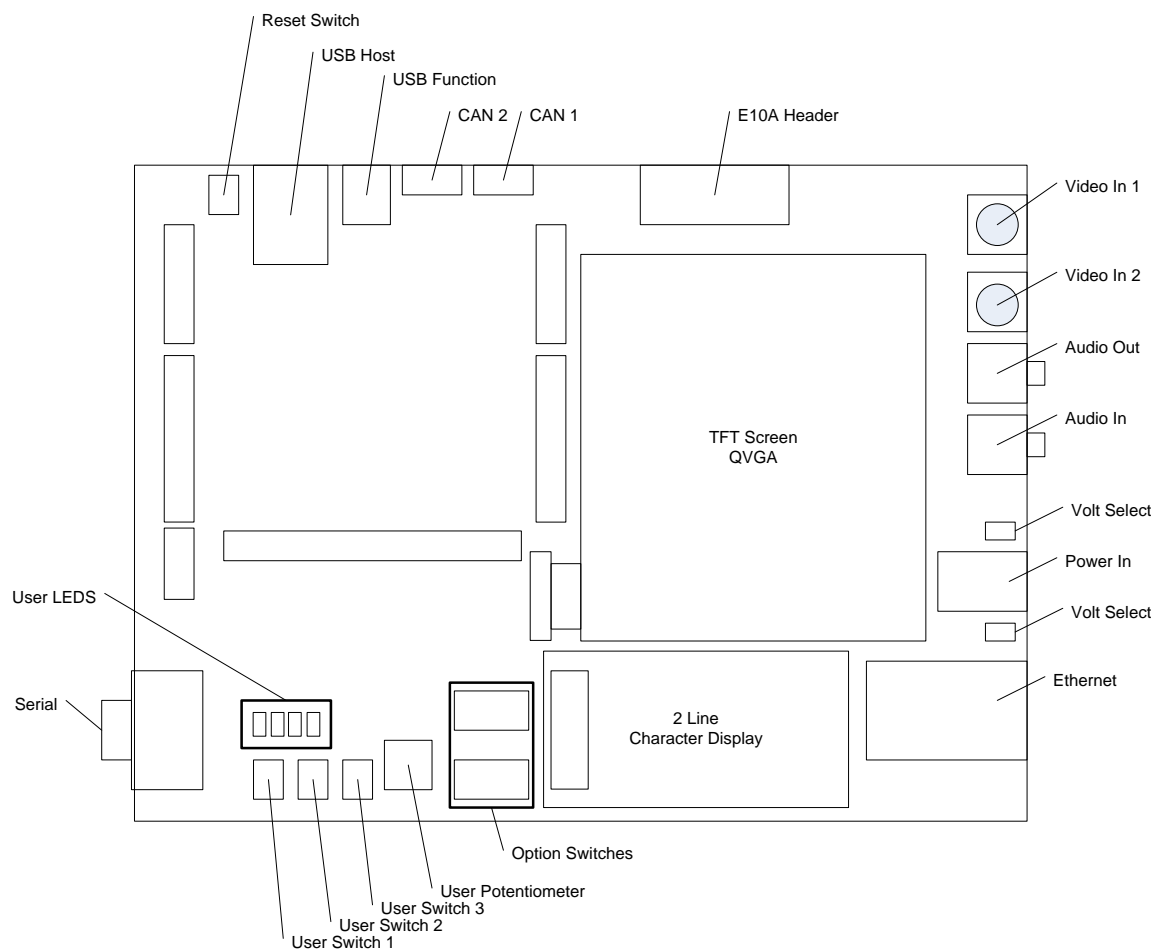
When the RSK is purchased, the RSK board has the 'Release' or stand-alone code from the example tutorial code pre-programmed into the Renesas microcontroller. On powering up the board the user LEDs will start to flash. After 200 flashes or after pressing any switch, the LEDs will flash at a rate controlled by the potentiometer.



## 3. Board Layout

### 3.1 Component Layout

Figure 3-1 below shows the top component layout of the board.



**Figure 3-1: Board Layout**

## 3.2 Board Dimensions

**Figure 3-2** below gives the board dimensions and connector positions. All the through-hole connectors are on a common 0.1 inch grid for easy interfacing.

**Figure 3-2: Board Dimensions**

### 3.3 Component Placement

Figure 3-3 below shows placement of individual components on the top-side PCB. Component types and values can be looked up using the board schematics.

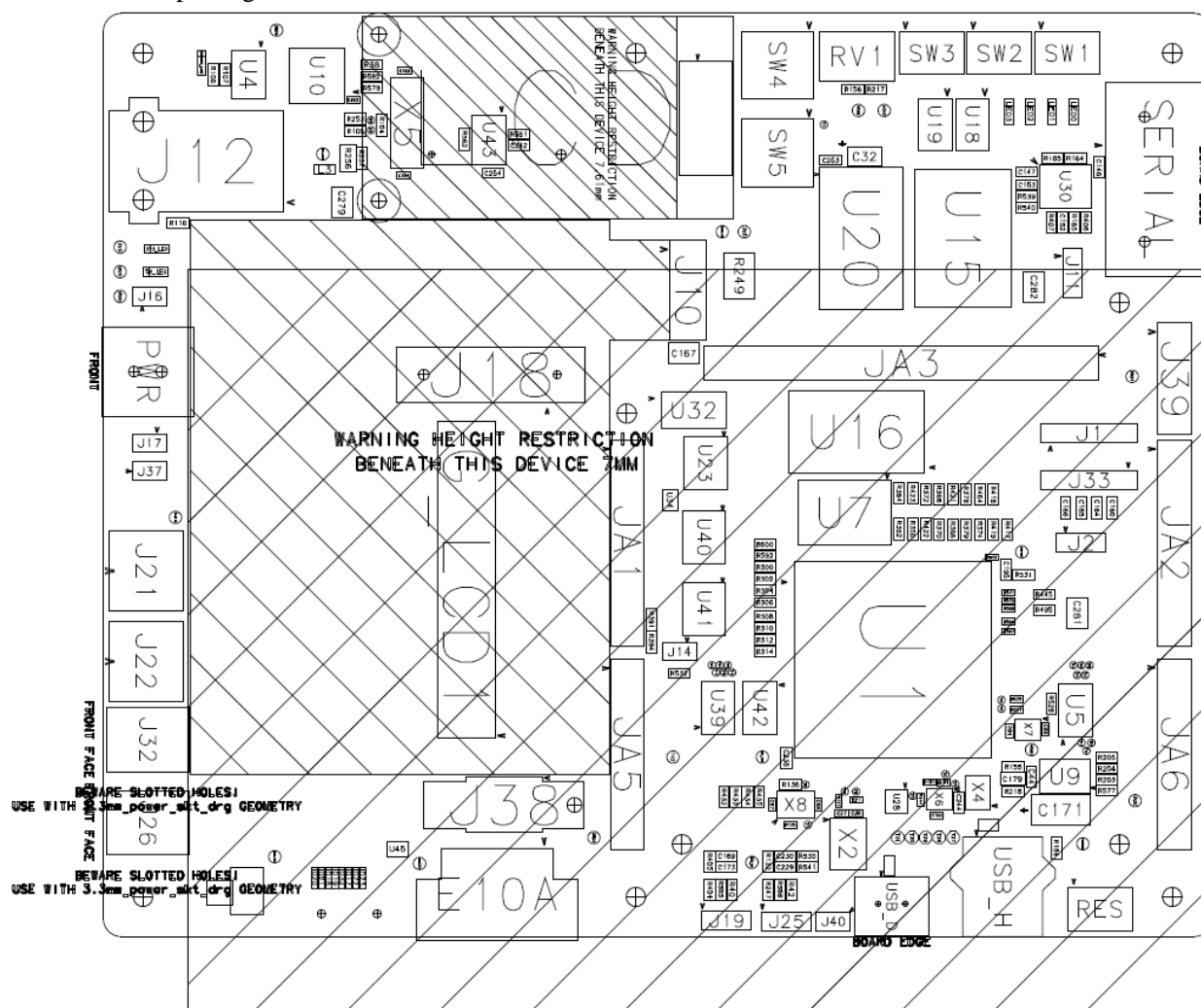
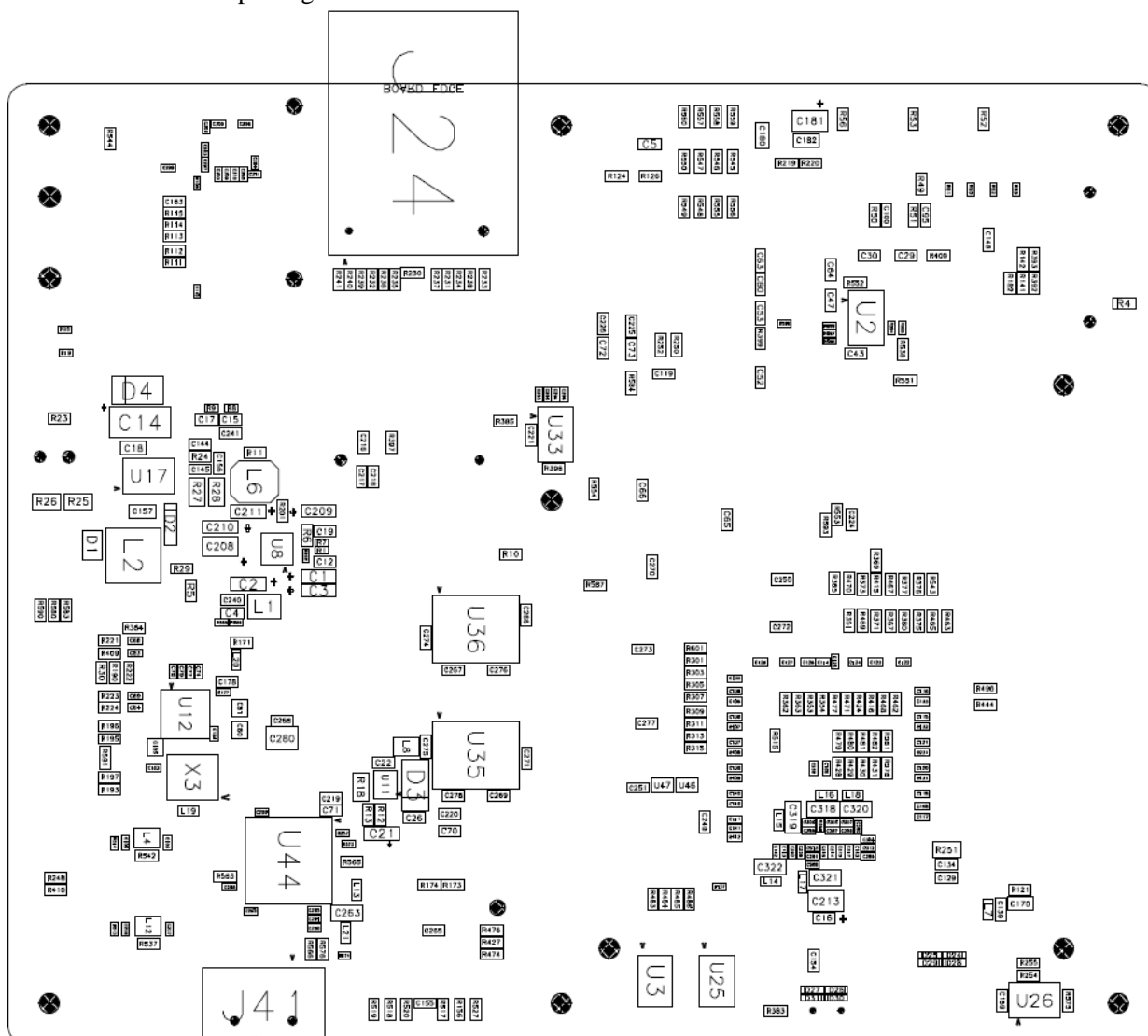


Figure 3-3: Top-Side Component Placement

**Figure 3-4** below shows placement of individual components on the bottom-side PCB. Component types and values can be looked up using the board schematics.

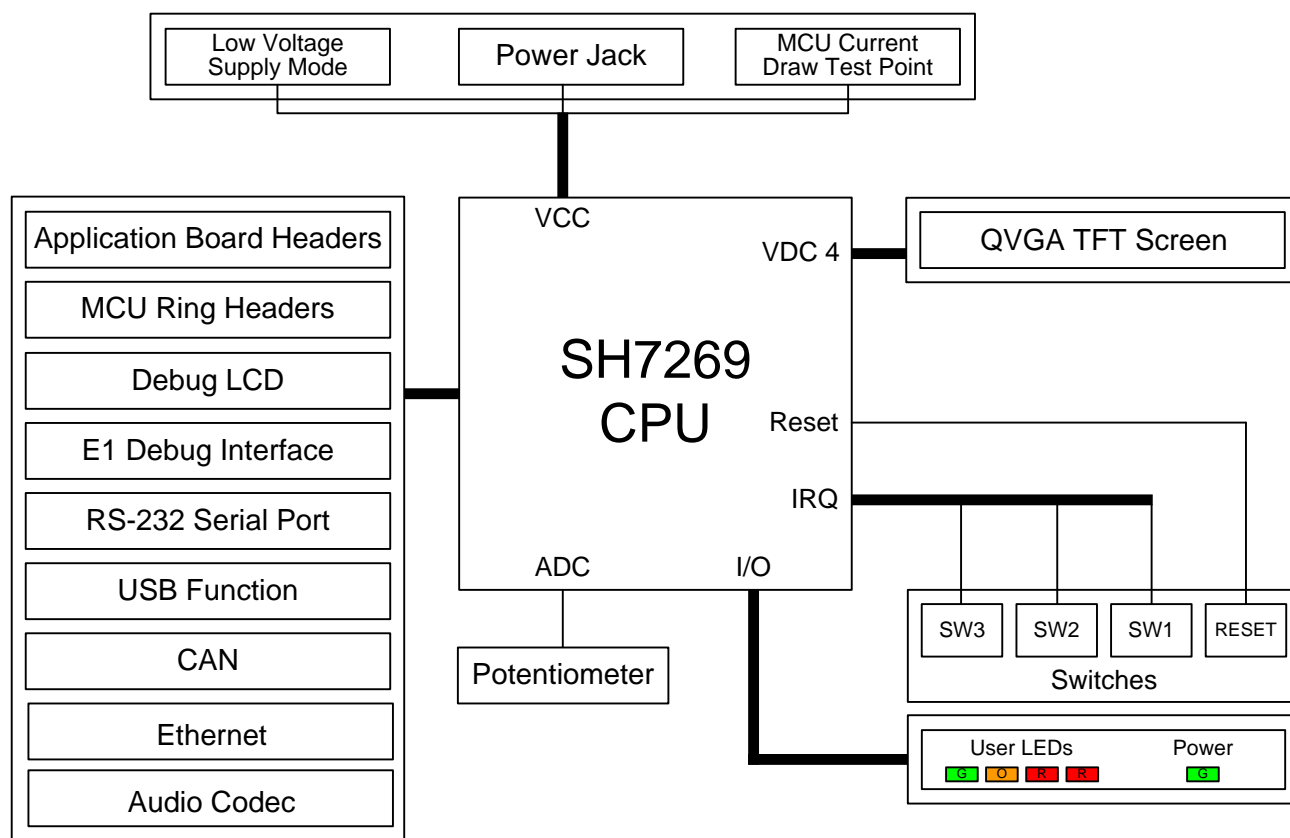


**Figure 3-4: Bottom-Side Component Placement**

## 4. Connectivity

### 4.1 Internal RSK Connections

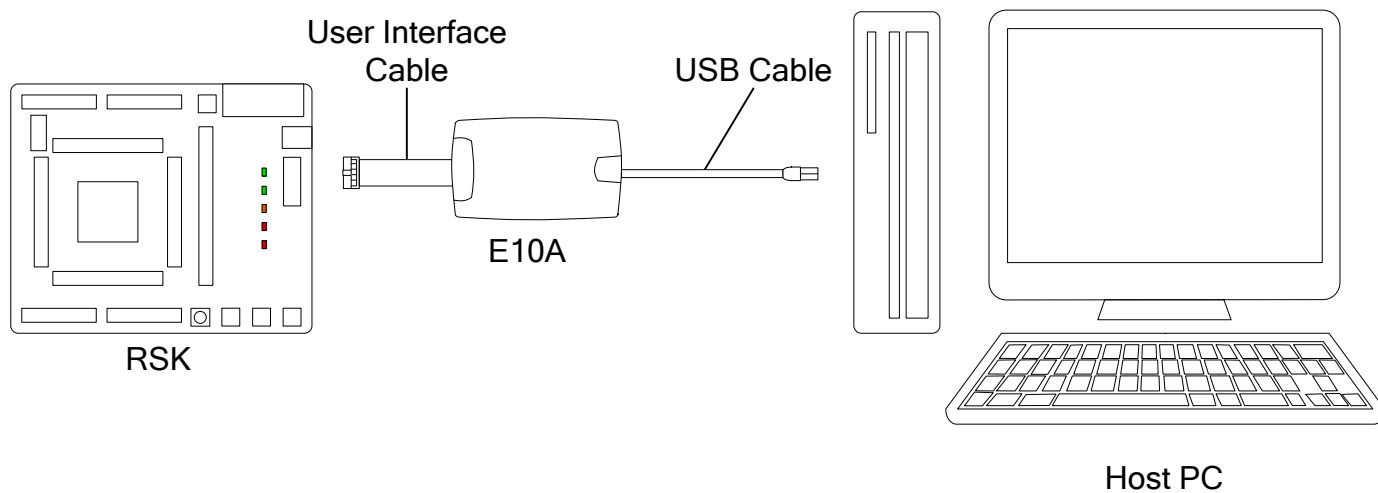
The diagram below shows the RSK board components and their connectivity to the MCU.



**Figure 4-1: Internal RSK Block Diagram**

## 4.2 Debugger Connections

The diagram below shows the connections between the RSK, E10A debugger and the host PC.



**Figure 4-2: Debugger Connection Diagram**

## 5. User Circuitry

### 5.1 Reset Circuit

A reset control circuit is fitted to the RSK. Resets are handled by this external device ensuring that the CPU receives a valid reset signal. The external Reset switch connect to this device.

### 5.2 Clock Circuit

A clock circuit is fitted to the RSK to generate the required clock signal to drive the MCU, and associated peripherals. Refer to the SH7269 hardware manual for details regarding the clock signal requirements, and the RSKSH7269 board schematics for information regarding the clock circuitry in use on the RSK. Details of the oscillators fitted to the RSK are listed in **Table 5-1** below.

Crystal	Function	Default Placement	Frequency	Device Package
X2	Real time Clock	Fitted	32.768kHz	Encapsulated, SMT
X3	Audio Codec Clock	Fitted	18.432MHz	Encapsulated, SMT
X4	CPU Video Clock	Fitted	27MHz	Encapsulated, SMT
X5	LAN Controller Clock	Fitted	25MHz	Encapsulated, SMT
X6	USB Clock	Fitted	48MHz	Encapsulated, SMT
X7	CPU Audio Clock	Fitted	24.576MHz	Encapsulated, SMT
X8	Main MCU crystal.	Fitted	12MHz	HC49, SMT

**Table 5-1: Oscillators**

### 5.3 Switches

There are four switches located on the RSK board. The function of each switch and its connection is shown in **Table 5-2**.

User switches are connected to a IIC port expander. This allows for additional ports to be connected to a microcontroller. The switches are connected to this only due to the large number of peripherals of the CPU that have been connected to demonstration circuitry on the board. It is possible for the CPU to receive an on interrupt when any of the switches are pressed by configuring PINT6 (Port H6 Pin 125). When the interrupt is generated the users code will need to poll the port expander to discover which switch caused the interrupt.

For further information regarding switch connectivity, refer to the RSKSH7269 board schematics.

Switch	Function	MCU Connection
RES	When pressed, the microcontroller is reset.	U26, Pin 5
SW1	Connects to IIC port expander U18 I/O0 input. An interrupt on PINT6 is possible	SCL2 / SDA2
SW2	Connects to IIC port expander U18 I/O1 input. An interrupt on PINT6 is possible	SCL2 / SDA2
SW3	Connects to IIC port expander U18 I/O2 input. An interrupt on PINT6 is possible	SCL2 / SDA2

**Table 5-2: Switch Connections**

### 5.4 LEDs

There are five LEDs on the RSK board. The function of each LED, its colour, and its connections are shown in **Table 5-3**.

The User LEDs are connected to a IIC port expander. This allows for additional ports to be connected to a microcontroller. The LEDs are connected to this only due to the large number of peripherals of the CPU that have been connected to demonstration circuitry on the board.

LED	Colour	Function	MCU Connection
5V_LED	Red	Indicates the power status	No connection
3V3_LED	Red	Indicates the power status	No connection
LED0	Green	User operated LED.	SCL2 / SDA2
LED1	Orange	User operated LED.	SCL2 / SDA2
LED2	Red	User operated LED.	SCL2 / SDA2
LED3	Red	User operated LED.	SCL2 / SDA2

**Table 5-3: LED Connections**

## 5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analogue input AN0, pin 118. The potentiometer can be used to create a voltage between A3V3 and ground (A3V3 is connected to an independent linear regulator).

The potentiometer is fitted to offer an easy method of supplying a variable analogue input to the microcontroller. It does not necessarily reflect the accuracy of the controller's ADC. Refer to the device hardware manual for further details.

## 5.6 Debug LCD Module

A debug LCD module is supplied with the RSK, and should be connected to the LCD header.

Care should be taken when installing the LCD module to ensure pins are not bent or damaged. The LCD module is vulnerable to electrostatic discharge (ESD); therefore appropriate ESD protection should be used.

The debug LCD module uses a 4-bit interface to reduce pin allocation. No contrast control is provided, as this is set by a resistor supplied on the display module. Connection information for the debug LCD module is provided in **Table 5-4** below.

Debug LCD Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	Ground	-	2	Board_5V	-
3	No Connection	-	4	DLCDRS	PJ12 (P220)
5	R/W (pulled to ground)	-	6	DLCDE (pulled to ground)	PJ11 (P219)
7	No Connection	-	8	No Connection	-
9	No Connection	-	10	No Connection	-
11	D12_DLCD4	PJ8 (P178)	12	D13_DLCD5	PJ9 (P179)
13	D14_DLCD6	PG18 (P180)	14	D15_DLCD7	PG19 (P181)

**Table 5-4: LCD Header Connections**

## 5.7 RS232 Serial Port

Connections between the RS232 header and the microcontroller are listed in **Table 5-5** below.



SCI Signal	Function	MCU Connection
TXD7	SCI7 Transmit Signal.	PJ15, pin 18
RXD7	SCI7 Receive Signal.	PE7, pin 77
CTS7	SCI7 Clear to send.	PJ27, pin 239
RTS7	SCI7 Ready to send.	PJ28, pin 66
RS232TX	External SCI Transmit Signal.	N/A
RS232RX	External SCI Receive Signal.	N/A

**Table 5-5: Serial Port Connections**

\* This connection is not available in the default RSK configuration - refer to §6 for the required modifications.

## 5.8 USB

Connections between the USB connector and the microcontroller are listed in **Table 5-6** below.

The SH7269 device supports both USB Host and USB Function. The selection of the peripheral support is possible using the user option switches on the board. A high speed switch (U46) is used to swap the USB signals between the two connectors.

The USB Host requires a switched power supply and this is provided by U9. An indication of an overcurrent condition with a connected peripheral can be detected on PINT7. The USB Function requires VBUS detection signal connection to the peripheral which is provided by a level translation FET.

To select between USB Host or Function the port expander U19 is used to control the USB connector in use.

USB Signal	Function	MCU Connection	USB Connection
USBDPOS	USB Data+	DP, Pin 94	3
USBDNEG	USB Data-	DM, 93	2
VBUSH_VBUS	USB VBUS	P16, pin 30	1
USBPCON	USB Host Power Control	PJ31, pin 69	VBUS
PINT7	Overcurrent Detection	PH7, pin 127	U9 – Power
USBSEL	Host or Function Selection	SCL2 / SDA2*	N/A

**Table 5-6: USB Connections**

\* This connection is not available directly and is controlled via IIC.

## 5.9 CAN

Connections between the CAN ICs (U3 and U25) and the microcontroller are listed in **Table 5-7** below.

The connection for the CAN enable has been connected to U19 which is a IIC controlled port expander.

CAN Signal	Function	MCU Connection	CAN IC Connection
CTX1	CAN Transmit	PJ23, pin 44	U3 pin 1
CRX1	CAN Receive	PJ22, pin 43	U3 pin 4
CANEN1	CAN Device Enable	SCL2 / SDA2 *	U3 pin 8
CTX2	CAN Transmit	PJ21, pin 42	U25 pin 1
CRX2	CAN Receive	PJ20, pin 38	U25 pin 4
CANEN2	CAN Device Enable	SCL2 / SDA2 *	U25 pin8

**Table 5-7: CAN Connections**

\* This connection is a not available directly and is controlled via IIC.

## 6. Configuration

### 6.1 Modifying the RSK

This section lists the option links that are used to modify the way RSK operates in order to access different configurations. Configurations are made by modifying link resistors or headers with movable jumpers or by configuration DIP switches

A link resistor is a 0Ω surface mount resistor, which is used to short or isolate parts of a circuit. Option links are listed in the following sections, detailing their function when fitted or removed. Bold, blue text indicates the default configuration that the RSK is supplied with. Refer to the component placement diagram (§3) to locate the option links, jumpers and DIP switches.

When removing soldered components, always ensure that the RSK is not exposed to a soldering iron for intervals greater than 5 seconds. This is to avoid damage to nearby components mounted on the RSK.

When modifying a link resistor, always check the related option links to ensure there is no possible signal contention or short circuits. Because some of the MCU's pins are multiplexed, some of the peripherals must be used exclusively. Refer to the SH7269 hardware manual and RSKSH7269 board schematics for further information.

### 6.2 MCU Operating Modes

Only ever change the MCU operating mode whilst the RSK is in reset, or turned off; otherwise the MCU may be damaged as a result.

**Table 6-1** below details the function of the jumpers associated with the MCU boot configuration modes.

Reference	Position One	Position Two	Position Three	Position Four
SW5 ON	<b>Disables SSCG</b>	<b>NOR Boot</b>	Enables NAND Write Protection	Enables NOR Flash Write Protection
SW5 OFF	Enables SSCG	QSPI Boot	<b>Disables NAND Write Protection</b>	<b>Disables NOR Flash Write Protection</b>

**Table 6-1: MCU Operating Mode Configuration**

**Table 6-2** below details the function of the jumpers associated with the MCU boot configuration modes.

Reference	Position One	Position Two	Position Three	Position Four
SW4 ON	<b>Enabled A15 to A22 Address Bus</b>	<b>Enabled D0 to D15 Data Bus</b>	<b>Enabled on Board TFT Screen</b>	SDRAM = 16MB QSPI = 6 Wire
SW4 OFF	Enabled QSPI Flash	Enabled NAND Flash	Enabled external HDMI connector	<b>SDRAM = 32MB QSPI = 4 wire</b>

**Table 6-2: MCU Operating Mode Configuration**

### 6.3 E10A Debugger Interface

Table 6-3 below details the function of the option links associated with the E10A debugger interface configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R427	Advanced User Debugger Clock connected to User interface.	When not fitted the E10A will support Standard Debugging mode. This connection is shared with DMARequest 0 and RSPCK1	R474, R476

Table 6-3: E10A Debugger Interface Option Links

### 6.4 USB Configuration

Table 6-4 below details the function of the option links associated with USB configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R184	Connects FRAME (USB_H connector) to GROUND.	USB Host connections should be grounded as the source	-
R383	Connects FRAME (USB_D connector) to GROUND.	USB Function frame connections are normally disconnected to prevent ground loops in systems.	-

Table 6-4: USB Option Links

## 6.5 ADC Configuration

**Table 6-5** below details the function of the option links associated with the Analogue-to-Digital circuit.

The circuit can be configured to connect to the on-board regulator or an external source. The board is configured by default to be connected to the on-board power source. To use an external source the internal source must be disconnected using the links provided. Ensure that the Analogue circuitry always has an appropriate power supply when the board is powered. Refer to the device manual for power sequencing and supply requirements.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R155	<b>Connects AVREF to A3v3</b>	To prevent injected noise on ADC do not connect R218 and R155 at the same time.	R218
R218	Connects AVREF to CON_AVREF	To prevent injected noise on ADC do not connect R218 and R155 at the same time.	R155
R217	<b>Connects AVCC to A3V3.</b>	To prevent injected noise on ADC do not connect R217 and R220 at the same time.	R220
R220	Connects AVCC to CON_AVCC.	To prevent injected noise on ADC do not connect R217 and R220 at the same time.	R217
R158	<b>Connects AVSS to AGND.</b>	To prevent injected noise on ADC do not connect R158 and R219 at the same time.	R219
R219	Connects AVSS to CON_AVSS	To prevent injected noise on ADC do not connect R158 and R219 at the same time.	R158
R428	<b>Connected PINT1 to the MCU PIN 119</b>	PINT1 shared on 7724_TFT connector and touchscreen controller	R479
R479	Connects AN1 on application header to MCU PIN 119	Touchscreen controller and 7724_TFT may not support all features when fitted.	R428
R429	<b>Connected PINT2 to the MCU PIN 120</b>	PINT2 is shared for Audio Codec and JA2 IRQ2 connections.	R480
R480	Connects AN2 on application header to MCU PIN 120	Application boards and Audio codec may not support all features when fitted.	R429
R430	<b>Connected PINT3 to the MCU PIN 121</b>	PINT3 is shared for the HDMI interface and JA2 IRQ0 connections.	R481
R481	Connects AN3 on application header to MCU PIN 121	HDMI interface and application boards may not support all features when fitted.	R430
R431	<b>Connected PINT4 to the MCU PIN 122</b>	PINT4 is used for JA2 IRQ1 connections.	R482
R482	Connects AN4 on application header to MCU PIN 122	Application boards may not support all features when fitted.	R431
R578	<b>Connected PINT5 to the MCU PIN 123</b>	The Ethernet controller uses PINT5.	R581
R581	Connects AN5 on application header to MCU PIN 123	Ethernet interface may not support all features when fitted.	R578

**Table 6-5: ADC Option Links**

## 6.6 RS232 Serial Port Configuration

The serial connector is connected by default to a fully connected asynchronous serial capable MCU port (SCI7). Option links are provided to allow this port to be disconnected and an alternate serial source to be selected from the application headers.

**Table 6-6** below details the function of the option links associated with serial port configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R141	<b>Connects TXD7 to the serial connector (pin 2).</b>	Do not connect R141 and R392 at the same time.	R392
R392	Connects the serial transceiver to the Application header serial port PIN 5.	Do not connect R141 and R392 at the same time.	R141
R142	<b>Connects RXD7 to the serial connector (pin 3).</b>	Do not connect R142 and R393 at the same time.	R393
R393	Connects the serial receiver to the Application header serial port PIN 6.	Do not connect R142 and R393 at the same time.	R142
R406	<b>Connects RTS7 to the serial connector (pin 7).</b>	When removed J11 will not connect to the MCU	SERIAL, R539 J11
R407	<b>Connects CTS7 to the serial connector (pin 8).</b>	When removed J11 will not connect to the MCU	SERIAL, R540 J11
R539	Connects RTS7 to the serial connector PIN 7.	When removed RTS will not connect to the Serial Port.	SERIAL
R540	Connects CTS7 to the serial connector PIN 8.	When removed CTS will not connect to the Serial Port	SERIAL
R164	<b>Enables Serial Driver</b>	Do not connect R164 and R165 at the same time.	R165
R165	Disables Serial Driver	Do not connect R164 and R165 at the same time.	R164

**Table 6-6: RS232 Serial Port Option Links**

## 6.7 External Bus Configuration

Table 6-7 below details the function of option links related to configuring the MCU's external bus.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R424	<b>Connects MCU signal pin A0_SSIDATA2_WDTOVF to SSIDATA2.</b>	Only fit one of R471, R424, R477.	R471, R477
R471	Connects MCU signal pin A0_SSIDATA2_WDTOVF to BA0.	Only fit one of R471, R424, R477.	R424, R477
R477	Connects MCU signal pin A0_SSIDATA2_WDTOVF to WDTOVF.	Only fit one of R471, R424, R477.	R424, R471
R300	<b>Connects A1_TIOC0A to BA1</b>	Only fit one of R300 and R301. When removed the external bus devices will not function.	R301
R301	Connects A1_TIOC0A to TIOC0A	When connected the Application header motor control signals are connected to the Timer pins. Care is required to ensure the MCU is not placed in to expanded mode at boot.	R300
R302	<b>Connects A2_TIOC0B to BA2</b>	Only fit one of R302 and R303. When removed the external bus devices will not function.	R303
R303	Connects A2_TIOC0B to TIOC0B	When connected the Application header motor control signals are connected to the Timer pins. Care is required to ensure the MCU is not placed in to expanded mode at boot.	R302
R304	<b>Connects A3_TIOC0C to BA3</b>	Only fit one of R304 and R305. When removed the external bus devices will not function.	R305
R305	Connects A3_TIOC0C to TIOC0C	When connected the Application header motor control signals are connected to the Timer pins. Care required to ensure the MCU is not placed in to expanded mode at boot.	R304
R306	<b>Connects A4_TIOC0D to BA4</b>	Only fit one of R306 and R307. When removed the external bus devices will not function.	R307
R307	Connects A4_TIOC0D to TIOC0D	When connected the Application header motor control signals are connected to the Timer pins. Care required to ensure the MCU is not placed in to expanded mode at boot.	R306
R308	<b>Connects A5_TIOC1A to BA5</b>	Only fit one of R308 and R309. When removed the external bus devices will not function.	R309
R309	Connects A5_TIOC1A to TIOC1A	When connected the Application header motor control signals are connected to the Timer pins. Care is required to ensure the MCU is not placed in to expanded mode at boot.	R308

Reference	Link Fitted Configuration	Cautions	Related Ref.
R310	<b>Connects A6_TIOC1B to BA6</b>	Only fit one of R310 and R311. When removed the external bus devices will not function.	R311
R311	Connects A6_TIOC1B to TIOC1B	When connected the Application header motor control signals are connected to the Timer pins. Care is required to ensure the MCU is not placed in to expanded mode at boot.	R310
R312	<b>Connects A7_TIOC2A to BA7</b>	Only fit one of R312 and R313. When removed the external bus devices will not function.	R313
R313	Connects A7_TIOC2A to TIOC2A	When connected the Application header motor control signals are connected to the Timer pins. Care is required to ensure the MCU is not placed in to expanded mode at boot.	R312
R314	<b>Connects A8_TIOC2B to BA8</b>	Only fit one of R314 and R315. When removed the external bus devices will not function.	R315
R315	Connects A8_TIOC2B to TIOC2B	When connected the Application header motor control signals are connected to the Timer pins. Care is required to ensure the MCU is not placed in to expanded mode at boot.	R314
R421	<b>Connects A23_TXD0 to the Application Header TXD0</b>	Only fit one of R421 and R467.	R467
R467	Connects A23_TXD0 to BA23 on J39	Only fit one of R467 and R421.	R421
R422	<b>Connects A24_SSISCK2 to SSISCK2 on J1</b>	Only fit one of R422 and R469.	R469
R469	Connects A24_SSISCK2 to BA24 on J39	Only fit one of R469 and R422.	R422
R423	<b>Connects A25_SSIWS2 to SSIWS2 on J1</b>	Only fit one of R423 and R470.	R470
R470	Connects A25_SSIWS2 to BA25 on J39	Only fit one of R470 and R423.	R423
R592	<b>Connects CS3 to Bus Header External chip Select ECS0n</b>	Only fit one of these three options	R600, R601
R600	Connects to Bus Header External chip Select CS3 to ECS1n	Only fit one of these three options	R592, R601
R601	Connects to Bus Header External chip Select CS3 to ECS2n	Only fit one of these three options	R592, R600

Table 6-7: External Bus Option Links



## 6.8 IIC Pin Configuration

**Table 6-8** below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R432	<b>Connects the Application Header timer connection TCLKA to the MCU PIN 70</b>		R483
R483	Connects SCL0 to the MCU PIN 70	This signal is used for the 7724_TFT connector (Not fitted) and J39	R432
R433	<b>Connects the Application Header timer connection TCLKB to the MCU PIN 71</b>		R484
R484	Connects SDA0 to the MCU PIN 71	This signal is used for the 7724_TFT connector (Not fitted) and J39	R434
R434	<b>Connects the Application Header timer connection TCLKC to the MCU PIN 72</b>		R485
R485	Connects SCL1 on J39 to the MCU PIN 72		R434
R435	<b>Connects the Application Header timer connection TCLKD to the MCU PIN 73</b>		R486
R486	Connects SDA1 on J39 to the MCU PIN 72		R435

**Table 6-8: IIC Pin Configuration Option Links**

## 6.9 SPI Pin Configuration

Table 6-9 below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R417	<b>Connects SSL10 connection from TFT headers</b>	Do not fit R417 and R463 at the same time.	R463
R463	Connects DMA Acknowledge signal to the MCU PIN 195	Do not fit R417 and R463 at the same time.	R417
R418	<b>Connects Master Out Slave Input 1 from TFT headers</b>	Do not fit more than one of R418, R464 and R543 at the same time.	R464, R543
R464	Connects DMA Transfer End signal to the MCU PIN 197	Do not fit more than one of R418, R464 and R543 at the same time.	R418, R543
R543	Connects NOR Flash Wait signal to the MCU PIN 197	Do not fit more than one of R418, R464 and R543 at the same time.	R418, R464
R419	<b>Connects CS2n from the external bus header to the MCU PIN 198</b>	Do not fit R419 and R465 at the same time.	R465
R465	Connects Master In Slave Out 1 from the TFT headers and J39 to the MCU PIN 198	Do not fit R419 and R465 at the same time.	R419
R427	Connects the AUD Clock to the MCU PIN 193	This is required for the AUDI function. Basic Debugger operation does not require this signal. Do not fit more than one of R427, R474 and R476 at the same time.	R474, R476
R474	<b>Connects RSPCK1 to the MCU from the TFT header</b>	If removed the TFT may not function. Do not fit more than one of R427, R474 and R476 at the same time.	R427, R476
R476	Connects DMA Request 0 from JA6 to the MCU PIN 193	Do not fit more than one of R427, R474 and R476 at the same time.	R427, R474

Table 6-9: SPI Pin Configuration Option Links

## 6.10 SPDIF Pin Configuration

Below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R444	<b>Connects the Debug LCD Screen to the MCU PIN 180</b>	Removing this link will disable the 2 line character LCD module. Do not connect R444 and R495 at the same time.	R495
R495	Connects SPDIF IN signal to the MCU PIN 180	Do not connect R444 and R495 at the same time.	R444
R445	<b>Connects the Debug LCD Screen to the MCU PIN 181</b>	Removing this link will disable the 2 line character LCD module. Do not connect R445 and R496 at the same time.	R496
R496	Connects SPDIF OUT signal to the MCU PIN 181	Do not connect R445 and R496 at the same time.	R445

Table 6-10: SPDIF Pin Configuration Option Links

## 6.11 Audio CODEC Pin Configuration

Table 6-11 below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R374	<b>Connects Serial Sound Interface SSISCK0 to the MCU PIN 199</b>	Do not fit more than one of R374, R375 and R376 at the same time.	R375, R376
R375	Connects CS5 to the MCU PIN 199	Check for Ethernet configuration when changing this link. Do not fit more than one of R374, R375 and R376 at the same time.	R579, R582, R374, R376
R376	Connects Sound Generator Output SGOUT0 from the MCU PIN 199 to J33	Do not fit more than one of R374, R375 and R376 at the same time.	R375, R374
R377	<b>Connects Serial Sound Interface SSISCK0 to the MCU PIN 200</b>	Do not connect R377 and R378 at the same time.	R378
R378	Connects Sound Generator Output SGOUT1 from the MCU to J33 PIN 200	Do not connect R377 and R378 at the same time.	R377
R379	<b>Connects Serial Sound Interface SSITXD0 to the MCU PIN 201</b>	Do not connect R379 and R380 at the same time.	R380
R380	Connects Sound Generator Output SGOUT2 from the MCU PIN 201 to J33	Do not connect R379 and R380 at the same time.	R379
R416	<b>Connects Serial Sound Interface SSIRXD0 to the MCU PIN 202</b>	Do not fit more than one of R416, R462 and R468 at the same time.	R462, R468
R462	Connects Sound Generator Output SGOUT3 from the MCU PIN 202 to J33	Do not fit more than one of R416, R462 and R468 at the same time.	R416, R468
R468	Connects RXD0 from JA6 to the MCU	Do not fit more than one of R416, R462 and R468 at the same time.	R416, R462
R221	<b>Connects Line in 2 to the Audio input jack</b>	Do not connect R409 and R221 at the same time.	R409
R409	Connects MIC left to the Audio input jack	Do not connect R409 and R221 at the same time.	R221
R223	<b>Connects Line in 1 to the Audio input jack</b>	Do not connect R224 and R223 at the same time.	R224
R224	Connects MIC right to the Audio input jack	Do not connect R224 and R223 at the same time.	R223
R580	<b>Connects MIC ground to the Audio input jack</b>	Do not connect R583 and R580 at the same time.	R583
R583	Connects Analogue ground to the Audio input jack	Do not connect R583 and R580 at the same time.	R580
R196	Connects Line Out Right to the Output jack	Do not connect R195 and R196 at the same time.	R195
R195	<b>Connects Headphone Right to the Output jack</b>	Do not connect R195 and R196 at the same time.	R196
R197	Connects Line Out Left to the Output jack	Do not connect R193 and R197 at the same time.	R193
R193	<b>Connects Headphone Left to the Output jack</b>	Do not connect R193 and R197 at the same time.	R197

**Table 6-11: Audio CODEC Pin Configuration Option Links**

## 6.12 Ethernet Pin Configuration

**Table 6-12** below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R579	Connects CS5 to the Ethernet Controller	Alternate connection for Ethernet. This signal is not valid if R375 is not fitted.	R582, R375
R582	Connects CS1 to the Ethernet Controller.	If R368 has been removed then this signal is not valid.	R368, R579
R624	Connects BWR to the Ethernet Controller	This connection should not be changed.	R625, R627, R628
R625	Location for Damping Resistor if required for EMC	This connection should not be changed.	R624, R627, R628
R627	Connects BWEo to the Ethernet controller	This connection should not be changed.	R624, R625, R628
R628	Location for Damping Resistor if required for EMC	This connection should not be changed.	R624, R625, R627

**Table 6-12: Ethernet Pin Configuration Option Links**

### 6.13 SD/MMC Pin Configuration

Table 6-13 below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Cautions	Related Ref.
R350	<b>Connects the NAND Flash FCE signal to the MCU PIN 216</b>	The NAND Flash will not function with this link removed. Do not connect more than one link in position R350, R351 and R352	R351, R352
R351	Connects the SD / MMC Card Detect signal to the MCU PIN 216	Do not connect more than one link in position R350, R351 and R352	R350, R352
R352	Connects IRQ4 from J39 to the MCU PIN 216	Do not connect more than one link in position R350, R351 and R352	R350, R351
R353	<b>Connects the SD / MMC Command signal to the MCU PIN 227</b>	The SD / MMC card will not function if this link is removed. Do not fit R353 and R354 at the same time.	R354
R354	Connects SCK3 signal from JA6 to the MCU PIN 227	Do not fit R353 and R354 at the same time.	R353
R362	<b>Connects the SD / MMC card D2 signal to the MCU PIN 229</b>	The SD / MMC card will not function if this link is removed. Do not fit R362 and R363 at the same time.	R363
R363	Connects TXD3 signal from JA6 to the MCU PIN 229	Do not fit R362 and R363 at the same time.	R362
R364	<b>Connects the SD / MMC card D3 signal to the MCU PIN 228</b>	The SD / MMC card will not function if this link is removed. Do not fit R364 and R365 at the same time.	R365
R365	Connects RXD3 signal from JA6 to the MCU PIN 228	Do not fit R364 and R365 at the same time.	R364
R366	<b>Connects the MMC card D4 signal to the MCU PIN 204</b>	The MMC card will not function if this link is removed. Do not fit R366 and R367 at the same time.	R367
R367	Connects SCK0 signal from JA6 to the MCU PIN 204	Do not fit R366 and R367 at the same time.	R366
R368	<b>Connects CS1 from the Ethernet controller to the MCU PIN 206</b>	The Ethernet controller will not function if this link is removed unless R579 and R582 are changed. Do not fit more than one link in positions R368, R415 and R369	R579, R582, R415, R369
R415	Connects the MMC card D5 signal to the MCU PIN 206	The MMC card will not function if this link is removed. Do not fit more than one link in positions R368, R415 and R369	R368, R369
R369	Connects SCK1 signal from JA6 to the MCU PIN 206	Do not fit more than one link in positions R368, R415 and R369	R368, R415
R370	<b>Connects the MMC card D6 signal to the MCU PIN 208</b>	The MMC card will not function if this link is removed. Do not fit R370 and R31 at the same time.	R371

Reference	Link Fitted Configuration	Cautions	Related Ref.
R371	Connects RXD1 signal from JA6 to the MCU PIN 210	Do not fit R370 and R371 at the same time.	R370
R372	Connects the MMC card D7 signal to the MCU PIN 212	The MMC card will not function if this link is removed. Do not fit R372 and R373 at the same time.	R373
R373	Connects TXD1 signal from JA6 to the MCU PIN 212	Do not fit R372 and R373 at the same time.	R372

**Table 6-13: SD/MMC Pin Configuration Option Links**

## 7. Headers

### 7.1 Application Headers

This RSK is fitted with application headers, which can be used to connect compatible Renesas application devices or as easy access to MCU pins.

Table 7-1 below lists the connections of the application header, JA1.

Application Header JA1					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	5V	-	2	0V	-
3	3V3	-	4	0V	-
5	AVCC	126*	6	AVSS	124
7	AVREF	128*	8	ADTRG	NC
9	AD0	118*	10	AD1	119*
11	AD2	120*	12	AD3	121*
13	DA0	NC	14	DA1	NC
15	IO_0	221	16	IO_1	36
17	IO_2	68	18	IO_3	16
19	IO_4	214	20	IO_5	232
21	IO_6	24	22	IO_7	67
23	IRQ3	NC	24	IIC_EX	NC
25	IIC_SDA	75*	26	IIC_SCL	74*

**Table 7-1: Application Header JA1 Connections**

\* Connection made through option link

Table 7-2 below lists the connections of the application header, JA2.

Application Header JA2					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	RESn	88	2	EXTAL	84
3	NMI	79	4	Vss1	GROUND
5	WDT_OVF	212*	6	SCIaTX	209*
7	IRQ0	121*	8	SCIaRX	208*
9	IRQ1	122*	10	SCIaCK	206*
11	M1_UD	25*	12	CTSRTS	
13	M1_UP	26*	14	M1_UN	28*
15	M1_VP	13*	16	M1_VN	15*
17	M1_WP	14*	18	M1_WN	20*
19	TMR0	70*	20	TMR1	71*
21	TRIGa	72*	22	TRIGb	73*
23	IRQ2	120*	24	M1_POE	-
25	M1_TRCCLK	-	26	M1_TRDCLK	-

**Table 7-2: Application Header JA2 Connections**

\* Connection made through option link



**Table 7-3** below lists the connections of the BUS application header, JA3

Bus Application Header JA3					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	A0	212	2	A1	13*
3	A2	14*	4	A3	15*
5	A4	20*	6	A5	25*
7	A6	26*	8	A7	28*
9	A8	30*	10	A9	32
11	A10	33	12	A11	34
13	A12	35	14	A13	40
15	A14	45	16	A15	46
17	D0	230	18	D1	234
19	D2	235	20	D3	236
21	D4	242	22	D5	243
23	D6	244	24	D7	245
25	RDn	1	26	WR	3
27	CSa	12*	28	CSb	12*
29	D8	246	30	D9	247
31	D10	248	32	D11	249
33	D12	251	34	D13	253
35	D14	254	36	D15	255
37	A16	48	38	A17	50
39	A18	52	40	A19	53
41	A20	54	42	A21	56
43	A22	58	44	SDCLK	61
45	CSc	12*	46	ALE	NC
47	HWRn	3	48	LWRn	NC
49	CAS	NC	50	RAS	NC

**Table 7-3: Bus Application Header JA3 Connections**

\* Connection made through option link

**Table 7-4** below lists the connections of the application header, JA5.

Application Header JA5					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	AD4	122*	2	AD5	123*
3	AD6	NC	4	AD7	NC
5	CAN1TX	44	6	CAN1RX	43
7	CAN2TX	42	8	CAN2RX	38
9	IRQ4	NC	10	IRQ5	NC
11	M2_UD	NC	12	M2_Uin	NC
13	M2_Vin	NC	14	M2_Win	NC
15	M2_Toggle	NC	16	M2_POE	NC
17	M2_TRCCLK	NC	18	M2_TRDCLK	NC
19	M2_Up	NC	20	M2_Un	NC
21	M2_Vp	NC	22	M2_Vn	NC
23	M2_W	NC	24	M2_Wn	NC

**Table 7-4: Application Header JA5 Connections**

\* Connection made through option link

**Table 7-5** below lists the connections of the application header, JA6.

Application Header JA6					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	DREQ	193*	2	DACK	195*
3	TEND	197*	4	STBYn	NC
5	RS232TX	18*	6	RS232RX	77*
7	SCIbRX	202*	8	SCIbTX	203*
9	SClctX	229*	10	SCIbCK	204*
11	SClckCK	227*	12	SClckRX	228*
13	M1_Toggle	NC	14	M1_Uin	NC
15	M1_Vin	NC	16	M1_Win	NC
17	Reserved	NC	18	Reserved	NC
19	Reserved	NC	20	Reserved	NC
21	Reserved	NC	22	Reserved	NC
23	Unregulated_VCC	-	24	GROUND	-

**Table 7-5: Application Header JA6 Connections**

\* Connection made through option link

## 8. Code Development

### 8.1 Overview

For all code debugging using Renesas software tools, the RSK board must be connected to a PC via an E10A debugger. An E10A For Starter Kit debugger is supplied with this RSK product.

### 8.2 Compiler Restrictions

The compiler supplied with this RSK is fully functional for a period of 60 days from first use. After the first 60 days of use have expired, the compiler will default to a maximum of 256k code and data. To use the compiler with programs greater than this size you need to purchase the full tools from your distributor.

The protection software for the compiler will detect changes to the system clock. Changes to the system clock back in time may cause the trial period to expire prematurely.

### 8.3 Debugging Support

The E10A emulator (as supplied with this RSK) supports break points, event points and basic trace functionality.

## 9. Additional Information

### Technical Support

For details on how to use High-performance Embedded Workshop (HEW), refer to the HEW manual available on the CD or from the web site.

For information about the SH7269 series microcontrollers refer to the SH7269 Group hardware manual.

Online technical support and information is available at: <http://www.renesas.com/rskSH7269>

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